U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Center
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TO ALL BILLFISHERS:

Here is the report from the National Marine Fisheries Service on the Seventeenth Hawaiian International Billfish Tournament (HIBT). Veteran anglers of the HIBT are familiar with this report. I'll give a short background for the rookies. For the last 14 years the National Marine Fisheries Service has sent representatives to HIBT. The representatives make observations and collect data. They also put up exhibits, give talks, give demonstrations and in so doing, provide a little spice to the tournament. After the tournament, the data and observations are examined, analyzed, and studied. The resulting information is summarized in a report to you. This is it.

Many people made it possible for us to get our job done. To the anglers, tournament officials, and volunteers from the community, Ray F. Sumida and I of the National Marine Fisheries Service extend our thanks for your wholehearted cooperation and support. Working with people who are enthusiastic and totally involved is exciting. We acknowledge you for a great and satisfying experience.

The Seventeenth Hawaiian International Billfish Tournament was a tournament of mosts. In the history of HIBT this tournament had: (1) the most blue marlin caught, (2) the most ahi (yellowfin tuna) caught, (3) the most shortbill spearfish caught, (4) the most qualifying fish caught, (5) the most world records surpassed by individual anglers, and (6) the most impressive and delicious pupus served at a cocktail party.

THE CATCH

Tournament competitors caught 193 fish. This phenomenal number becomes even more so in light of the previous high of 110 fish caught in 1974 (Table 1). The number of fish caught in this tournament is 75% more than the highest number caught in earlier tournaments and 182% more than the average tournament catch.

Another way to look at the catch is to relate it to the fishing effort. This year 79 teams participated. The number of boat-days of fishing per fish was 2.0. In the extreme right column of Table 1 is listed the statistics for previous years. This year's 2.0 boat-days per fish is better by 31% than the previous best of 2.9 boat-days per fish.

The catch consisted of 104 blue marlin, 79 ahi, 8 shortbill spearfish, and 2 striped marlin. The weight range of the blue marlin was 107-536 lb with an average of 207 lb. Half of the blue marlin weighed less than 185 lb. The ahi ranged from 102 to 261 lb and averaged 186 lb. The smallest and largest shortbill spearfish weighed 25 and 39 lb, respectively. The striped marlin were 53 and 56 lb.

Sex determinations were made on 86 of the blue marlin. The male to female ratio was 4.4:1. The ratio of males to females has ranged from 1.2:1 to 8:1 over the past 14 years (Table 2). Occasionally someone will point out that there is an apparent correlation between a high occurrence of males and a high catch. This correlation was investigated. Because of a sharp increase in catch rates since 1970 (to be discussed later), the data prior to that year could not be treated together with the later data (Figure 1). Statistical procedures on the data showed no significant correlation between catch rate and the ratio of males to females. It is possible that with more data points the correlation will show significance. Additional data points will be collected at future tournaments.

FISHING AREAS

Your daily radio reports were analyzed for information. Area India was the most popular by far. The reports show that 945 boat-hours of fishing were spent in area India. Area Juliet was second with 388 boat-hours of fishing. Other favored areas ranked in order were: Sierra, Lima, Uniform B, Kilo, Uniform A, and Tango. The following analyses of areas are restricted to the aforementioned areas, in which 100 or more boat-hours of fishing time were spent.

There was no area with a high strike rate. Area Uniform B had the highest with 0.28 strike per boat-hour. Compared to 1974, the strike rates were more evenly distributed (Figure 2). In 1974 the strike rates were high in one area, moderate in two areas and low in six areas. This year the strike rates were moderate in six areas and low in two areas. Area India had a lot of strikes (197) but also had a high number of boat-hours. The result was a moderate strike rate. With respect to strike rates, area India ranked fifth among the eight areas analyzed.

The distribution of the catch by area and date is presented in Table 3. Area India provided the highest catch with 69 fish. Area Juliet with a yield of 36 fish was a far second. As with the strike rate, the catch per boat-hour in area India was low because of the many boat-hours expended in that area. Of the eight areas considered, area India ranked sixth in catch rate. Generally, the correspondence between strike rate and catch rate was good (Figure 3) with the exception of area Uniform B which had the highest strike rate and ranked seventh in catch rate.

ANALYSIS OF FISHING

The extraordinary increase of this year's catch over last year's catch warranted an investigation into the causes of the increase. Undoubtedly one can approach this by various methods. I chose to consider the amount of fish caught as being the product of three factors: strike rate, boat-hours of fishing, and percent of strikes landed. Strike rate is an index of the availability of fish in the tournament areas, a factor which is uncontrolled by man so far. Boat-hours of fishing is a measure of the fishing effort. That is almost entirely controlled by the Governors of HIBT. I say almost entirely because although they decide on the number of teams fishing, they don't control the breakdowns or the fighting time, which are taken into consideration in the calculation of boat-hours of fishing. Percent of strikes landed is a measure of your skill as anglers and the teamwork between anglers and boat captains.

The results of the analysis were a surprise. The availability of fish between the 2 years was not very different...0.22 strike per boat-hour for 1975 and 0.21 for 1974. The increase in fishing effort was obvious. There were 79 competing teams in 1975 and 64 in 1974. The major factor contributing to the increase was the percent of strikes landed: 33.6% in 1975 compared to 23.6% in 1974. The apportionment of the increase in catch of 1975 over 1974 to the various causes is as follows:

Availability of fish	8%
Fishing effort	29%
Skill of anglers	63%

The statistics show that you, the anglers, were mostly responsible for the great catch in HIBT 1975. Congratulate yourselves.

FISHING TACKLE

The trend towards using lighter line continued in this tournament. The percent of fish caught on 130-lb test line dropped to 3.1%, on 80-lb test line dropped slightly to 52.1%, and on 50-lb test line rose to 44.8% (Figure 5). The decline in the use of 80-lb test line ended a steady increase in its use since 1970. Most of the fish were still caught on 80-lb test line, however. When the catch on various lines is analyzed by species (Figure 4), we see that more blue marlin were caught on 50-lb test than on any other line whereas most of the ahi were caught on 80-lb test.

The weight distributions of the fish caught on lines of various strengths (Figure 5) are similar. The average weights of blue marlin caught on 50- and 80-lb tests were 198.2 lb and 216.1 lb, respectively. For ahi the averages were 183.0 lb and 188.9 lb. Statistical tests show no significant difference between the weights of fish caught on 50- and 80-lb tests.

A question that naturally arises with the greater use of 50-lb test line is, "Are more fish getting away?" There are no data on the percentage of hookups landed for the various line strengths used. The overall percentage of hookups landed this year was 46% (Figure 4). This is the highest percentage of hookups landed since 1970. The use of 50-lb test line was also greatest. Apparently the use of 50-lb test line in preference over heavier lines does not increase the loss of fish during fishing. On the other hand, the weight distribution graph (Figure 5) shows that six blue marlin over 300 lb were caught on 80-lb test line compared to three on 50-lb test line. Perhaps the big ones are getting away. The numbers are small, however, and may be the result of chance.

Analyses of data on fighting time produced more results that were surprising. Fighting time for blue marlin caught on 50-lb test line did not differ significantly from that of 80-lb test. The average fighting time was 41.6 minutes on 50-lb test and 42.1 minutes on 80-lb test. Fighting time of blue marlin on 50-lb test was not related to the weight of the fish. On 80-lb test the relationship between fighting time and weight of fish was statistically significant although points on a graph of fighting time on weight (Figure 6) were quite scattered. The fighting time data for the ahi presented a completely different picture from the blue marlin data, a picture that conformed much more to my expectations. The average fighting time of 92.2 minutes for ahi on 50-lb test was significantly different from the average of 46.1 minutes for ahi on 80-lb test. Fighting time was related to the weight of the fish on both lines (Figure 7). The weight of the fish had a greater effect on fighting time with 50-lb test than it did with 80-lb test. Lines defining the relationship between fighting time and fish weight for both lines are shown in Figure 7. The slope of the line for 50-lb test is three times the slope for 80-lb test.

STOMACH CONTENTS

The stomachs of 76 blue marlin were cut open and their contents examined.

We identified 12 different species of fish in the stomachs. Some of the fish were digested beyond recognition and others could be identified as belonging to the tuna family but no further. In addition to fish, the stomachs also contained squid. The items, the number of stomachs they occurred in, and the percent of the stomachs they occurred in, are listed in Table 4. The most common item was skipjack tuna, which occurred in 43% of the stomachs. Seventy percent of the stomachs contained some species of tuna. Squid occurred in 25% of the stomachs; opelu, a mackerel scad, in 17%; and pelagic spiny puffer in 12%.

Fish found in the stomachs were measured. Much of the fish remains were not measurable but we were able to count the number of fish which contributed to the remains. Lengths of the fish found in the stomach (Figure 8) ranged from 1/2 to 24 inches. Slightly over half of the fish (57%) were longer than 6 inches. The largest fish was a mahimahi. Species that made up the larger fishes in the stomach were: skipjack tuna, pelagic puffer, opelu, and mahimahi.

TIDES AND TIME

Since 1970 HIBT has been scheduled to coincide with the new moon. The two- to threefold increase in catch that resulted is now an old story. Every year the tournament report has included a graph of the rate of strikes superimposed on the tide pattern (Figure 9). Inspection of these graphs has shown no consistent relationship between strike rate and tide phase. The HIBT strike rates for various phases of the tide for the years 1970-75 inclusive were averaged (Figure 10). The average strike rate was highest during the low water slack tide. Statistical tests showed a significant difference between the strike rates of low water slack tide and rising tide. The strike rates of other tidal phases did not differ significantly.

This year's catches of blue marlin and ahi were plotted against the hour at which the fish struck (Figure 11). The graph for the blue marlin shows a peak for the hour 11-12 o'clock. That peak was primarily the result of 10 blue marlin caught at that hour during the last day of the tournament. During the other 4 days of fishing the catch during that hour did not vary very much from the hourly average for the day. The graph for ahi shows peaks for the hour 9-10 and 11-12. These peaks were the result of consistent catches for those hours throughout the week. A feature of both the marlin and ahi graphs is the low catch during the first hour of the day. The low catch is to be expected because the teams travel to the fishing grounds during that hour.

To the many, many workers up front and behind the scenes, to the participating anglers, and to the charter boat captains and crews: Congratulations for creating an excellent tournament.

Until we meet again at the next annual Hawaiian International Billfish Tournament, Aloha.

Heeny S. H. Yuen

Heeny S. H. Yuen
Leader, Recreational Fisheries

Attachments

November 20, 1975

Table 1.--Numbers of qualifying game fish landed and teams fishing during Hawaiian International Billfish Tournaments, 1962-75.

Year	Blue marlin	Black marlin	Striped marlin	Shortbill spearfish	Sailfish	Yellowfin tuna ≥ 100 lb	Total qualifying fish	Number of teams	Number of boat-days fishing per fish[1]
1962	30	1	--	--	1	19	51	68	6.7
1963	19	2	1	--	--	26	48	72	7.5
1964	31	--	1	--	--	2	34	69	10.1
1965	47	--	--	--	--	9	56	78	6.9
1966	26	3	2	--	--	7	38	72	9.5
1967	63	--	1	--	--	18	82	68	4.2
1968	36	2	4	--	--	4	46	85	9.2
1969	32	1	--	--	--	4	37	75	10.1
1970	91	--	2	--	2	14	109	73	3.3
1971	41	--	3	1	--	47	92	77	3.4
1972	77	--	--	--	--	11	88	59	3.4
1973	76	--	1	3	1	17	98	61	3.1
1974	66	2	1	6	--	37	110	64	2.9
1975	104	--	2	8	--	79	193	79	2.0

[1]Nine-hour fishing days, 1962-73; 8-hour days in 1974 and 1975.

Table 2.--Sex ratios for blue marlin examined from Hawaiian International Billfish Tournaments, 1962-75.

Year	Number of males	Number of females	Ratio males to females
1962	16	7	2.3:1
1963	13	6	2.2:1
1964	14	12	1.2:1
1965	35	8	4.4:1
1966	16	8	2.0:1
1967	51	13	3.9:1
1968	24	10	2.4:1
1969	23	8	2.9:1
1970	63	14	4.5:1
1971	21	9	2.3:1
1972	64	8	8.0:1
1973	47	21	2.2:1
1974	46	14	3.3:1
1975	70	16	4.4:1

Table 3.--Number of fish by species, area, and date from Hawaiian International Billfish Tournament 1975.

	A	C	D	H	I	J	K	L	M	N_A	N_B	R	S	T	U_A	U_B	V
Blue marlin																	
August 4	—	—	1	—	8	6	2	—	—	—	—	1	4	1	1	—	1
August 5	—	2	—	—	9	2	1	1	—	—	—	—	2	1	2	—	1
August 6	—	—	—	—	10	1	1	4	—	—	—	—	1	3	—	2	1
August 7	—	—	—	—	2	1	—	1	—	—	—	—	1	1	—	2	—
August 8	1	—	—	—	8	3	3	2	1	1	1	—	—	1	2	3	1
Total	1	2	1	—	37	13	7	8	1	1	1	1	8	7	5	7	4
Average weight (lb)	153.0	178.0	207.0	—	212.6	225.0	252.6	169.4	149.0	364.0	246.0	263.0	218.8	195.6	172.8	157.6	203.3
Ahi																	
August 4	—	—	—	—	4	6	1	2	—	1	—	—	—	1	2	—	—
August 5	—	—	—	2	8	4	—	—	—	—	—	—	1	1	1	—	—
August 6	—	—	—	—	9	1	1	—	—	—	—	—	—	—	—	1	—
August 7	—	—	—	—	7	6	2	—	—	—	—	—	—	2	—	—	—
August 8	—	—	—	—	3	2	1	1	1	—	2	—	1	2	1	2	—
Total	—	—	—	2	31	19	5	3	1	1	2	—	2	6	4	3	—
Average weight (lb)	—	—	—	256.5	184.5	186.4	203.6	171.3	178.0	132.0	176.0	—	132.5	191.5	175.3	206.7	—
Striped marlin																	
August 4	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—
Average weight (lb)	—	—	—	—	—	54.5	—	—	—	—	—	—	—	—	—	—	—
Shortbill spearfish																	
August 4	—	—	—	—	—	1	—	—	—	2	—	—	—	—	—	—	—
August 5	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—
August 7	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—
August 8	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	1	2	1	—	—	2	—	—	1	—	1	—	—
Average weight (lb)	—	—	—	—	32.0	31.5	37.0	—	—	35.5	—	—	35.0	—	27.0	—	—

Table 4.--Stomach contents of blue marlin from Hawaiian International Billfish Tournament 1975.

Food items	Date and number of stomachs containing listed food items					Percent occurrence
	August					
	4	5	6	7	8	
Fish						
Tuna, Scombridae						70
Skipjack tuna, Katsuwonus pelamis	7	8	7	3	8	43
Frigate mackerel, Auxis sp.	2	2	5	-	1	13
Unidentified tuna	6	5	5	1	7	32
Jacks, Carangidae						18
Opelu, Decapterus pinnulatus	4	5	5	1	3	17
Akule, Trachurops crumenophthalmus	-	-	-	1	-	1
Dolphins, Coryphaenidae						9
Mahimahi, Coryphaena hippurus	-	3	1	-	2	8
Pompano dolphin, Coryphaena equiselis	-	-	-	1	-	1
Pelagic spiny puffer, Diodontidae	1	3	1	1	3	12
Surgeonfish, Acanthuridae	-	-	1	-	-	1
Lancetfish, Alepisauridae	2	1	-	-	-	4
Snake mackerel, Gempylidae	1	-	-	-	-	1
Butterflyfish, Chaetodontidae	-	-	-	1	-	1
Goatfish, Mullidae	-	-	1	-	-	1
Needlefish, Belonidae	-	-	-	1	1	3
Halfbeak, Hemiramphidae	-	-	1	-	-	1
Unidentified fish	6	5	5	2	7	33
Invertebrates						
Squid, Decapoda	3	5	4	4	3	25
Empty or everted stomachs	1	1	3	1	4	13
Number of stomachs examined	13	17	19	8	19	

Total: 76

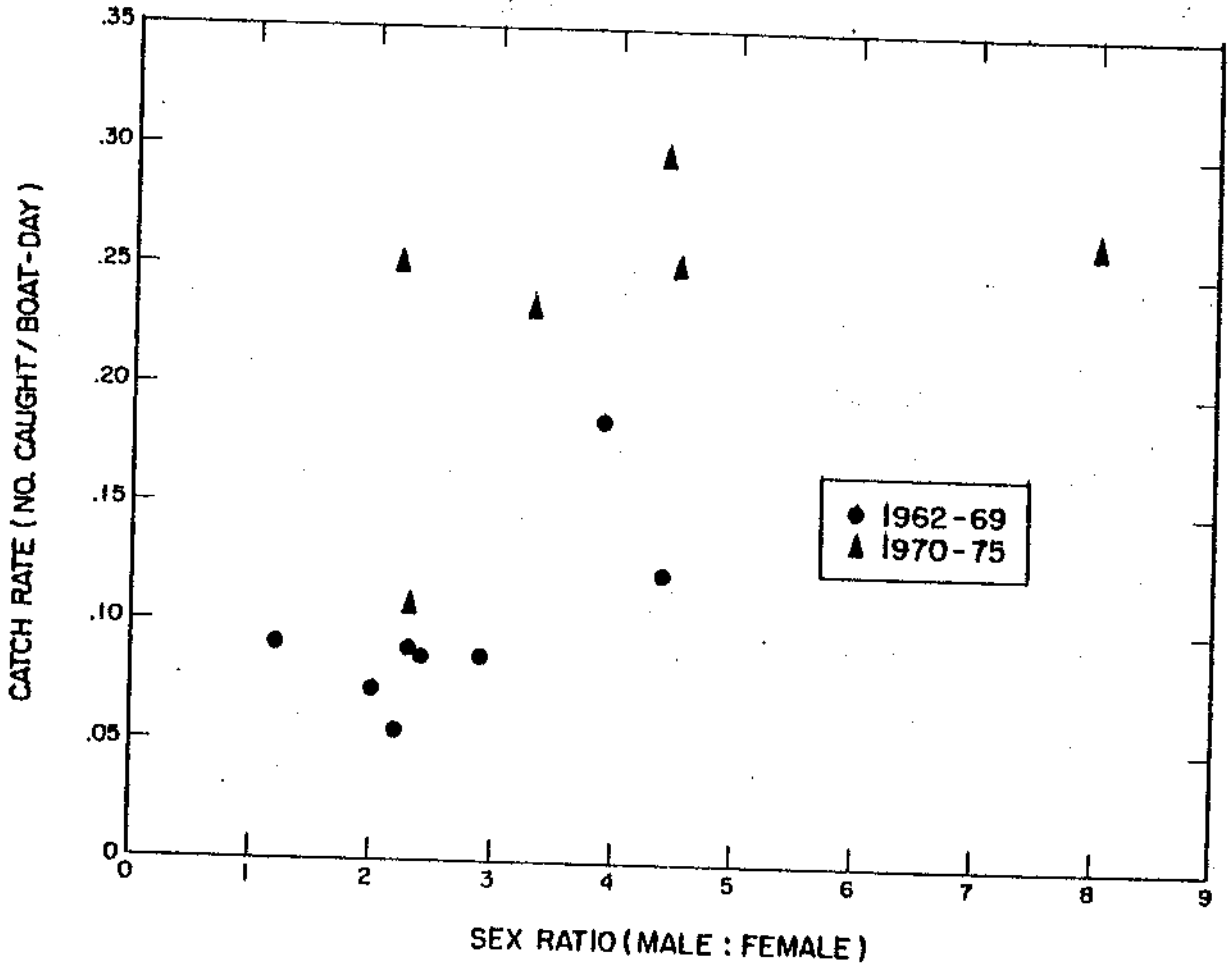

Figure 1.--Plot of blue marlin catch rates on sex ratios.

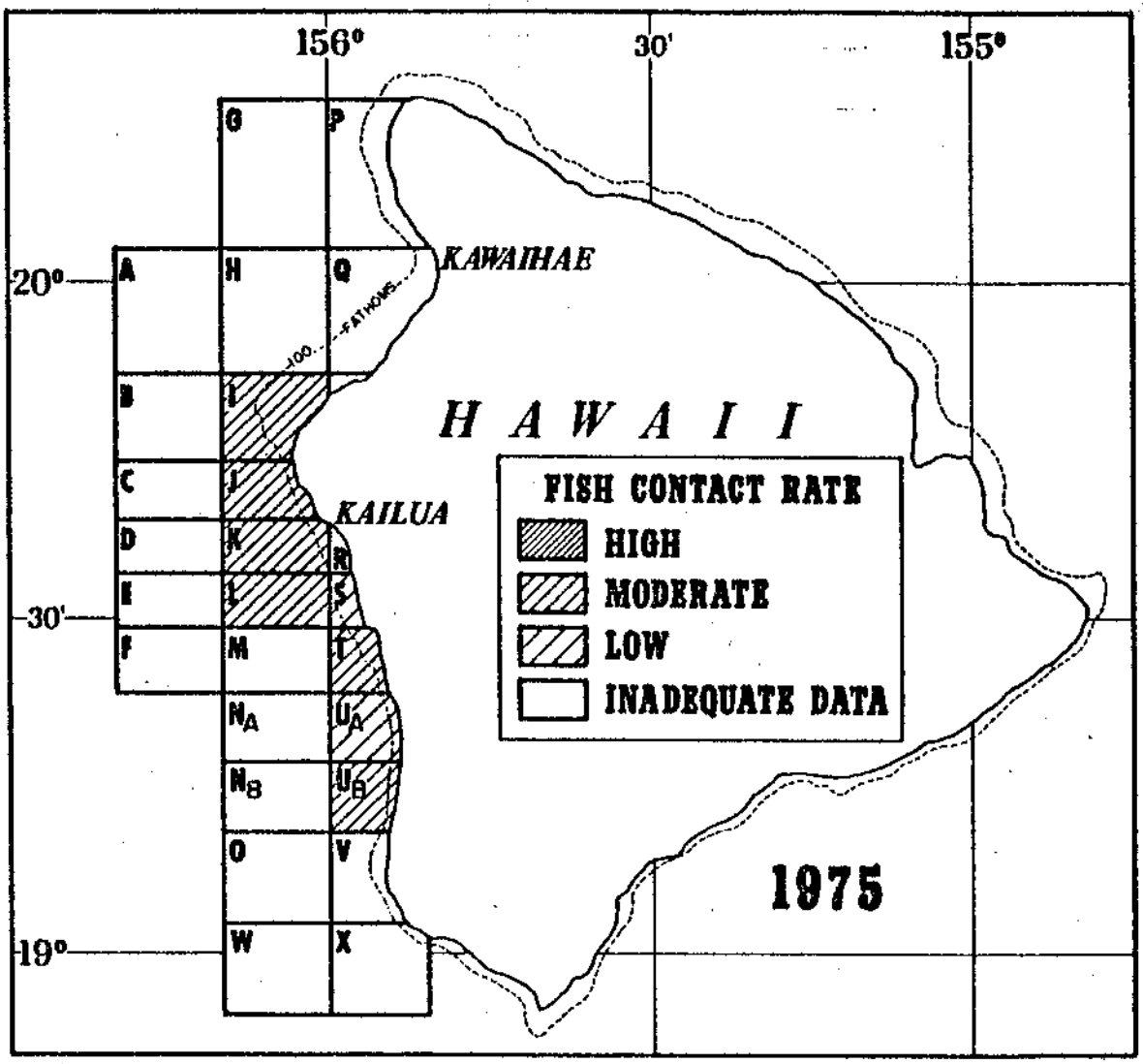

Figure 2.--Strike rates in various fishing areas.

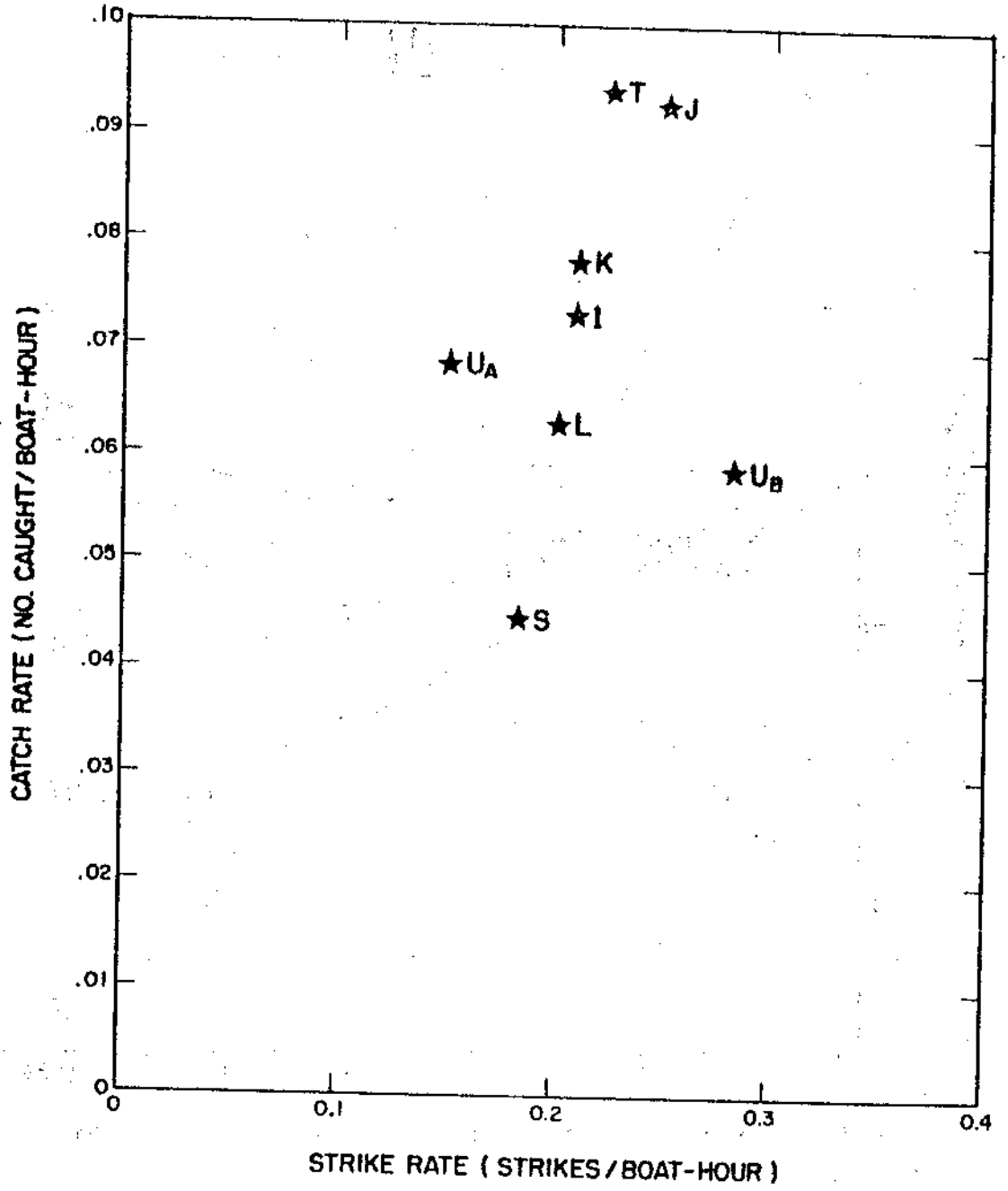

Figure 3.--Strike rates and catch rates of the most fished areas.

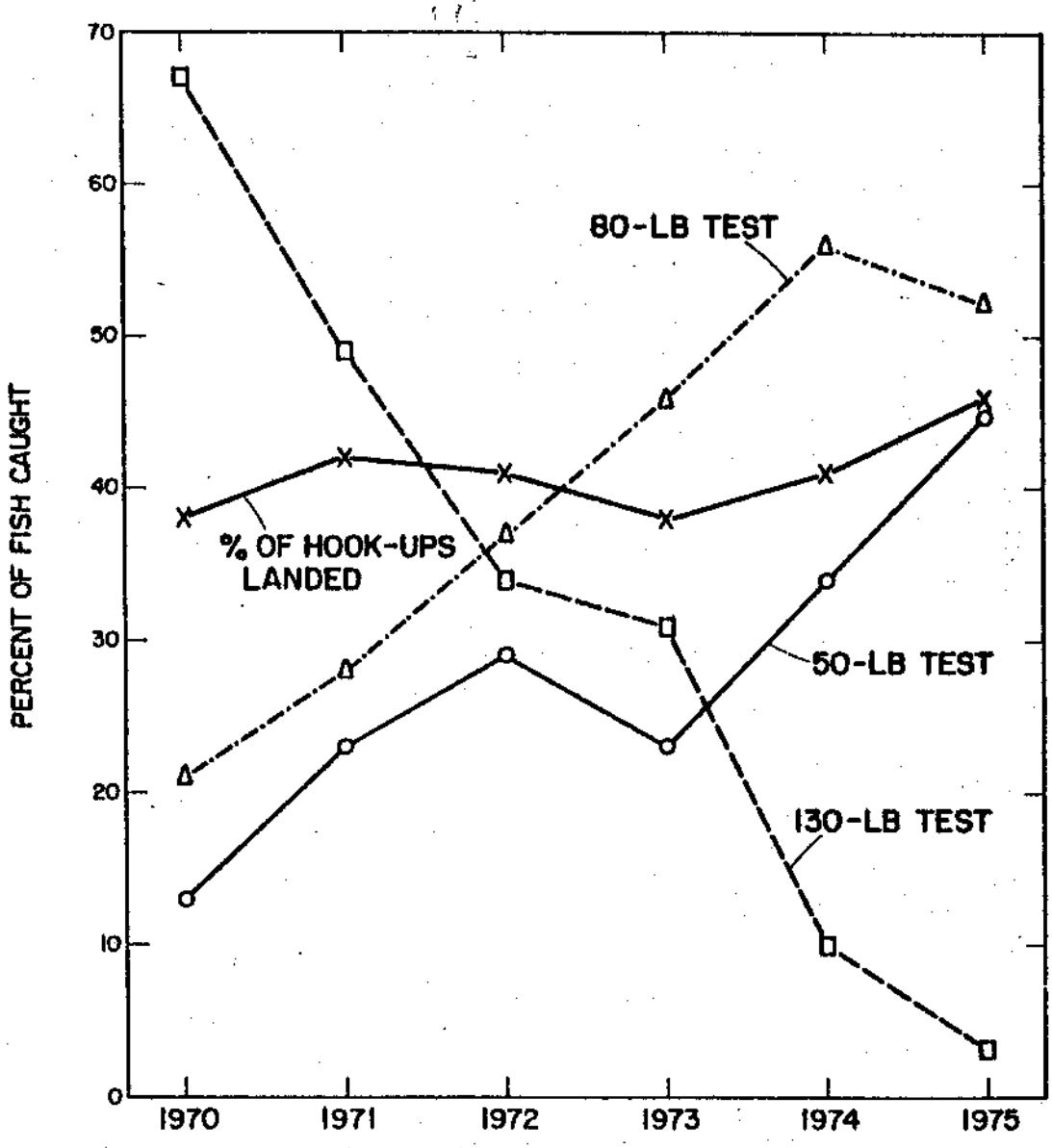

Figure 4.--Proportion of catch landed on lines of various sizes.

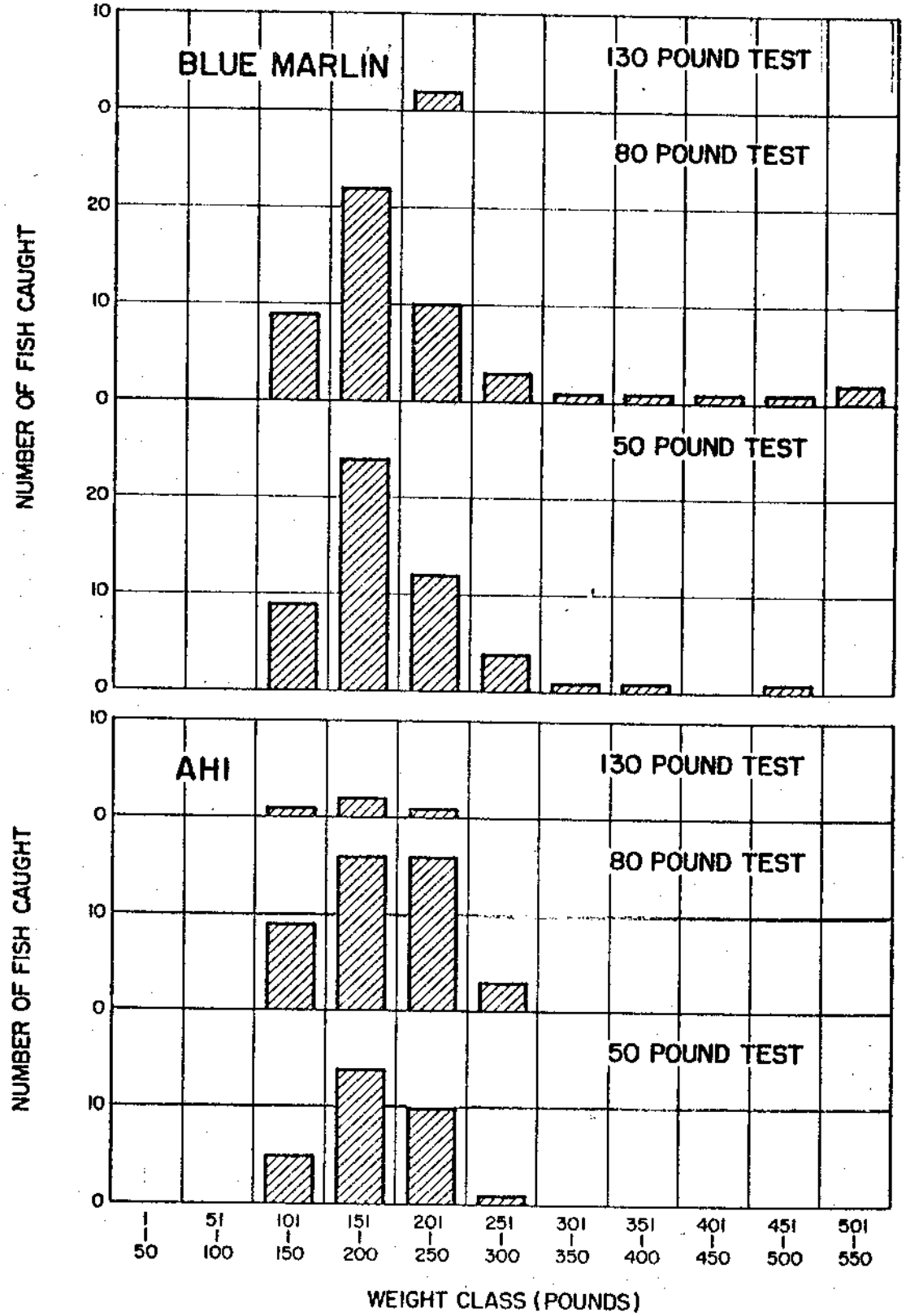

Figure 5.--Frequency distribution of weights of fish caught on various size lines.

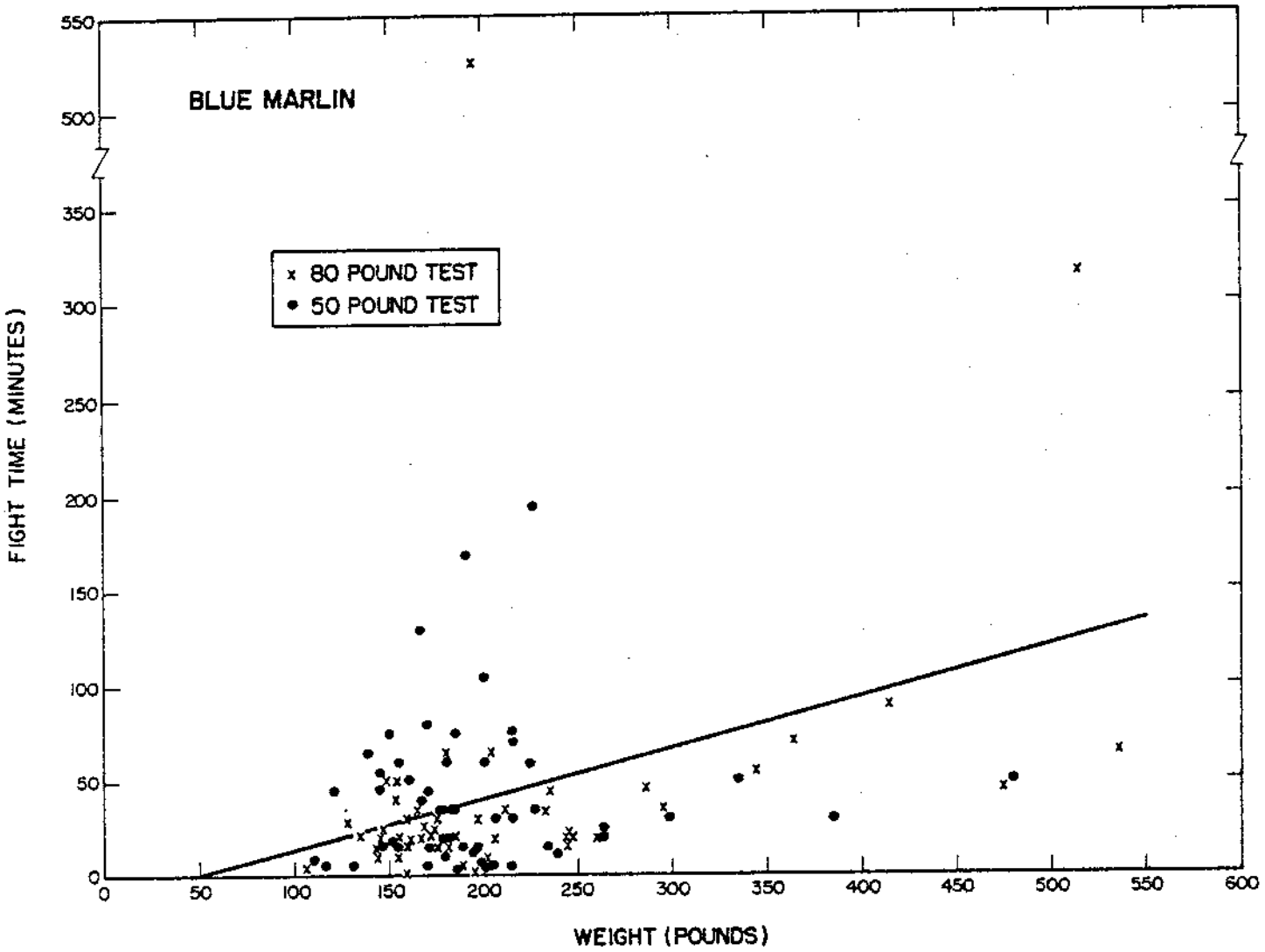

Figure 6.--Relationship of fighting time to weight of blue marlin on 50- and 80-lb test lines.

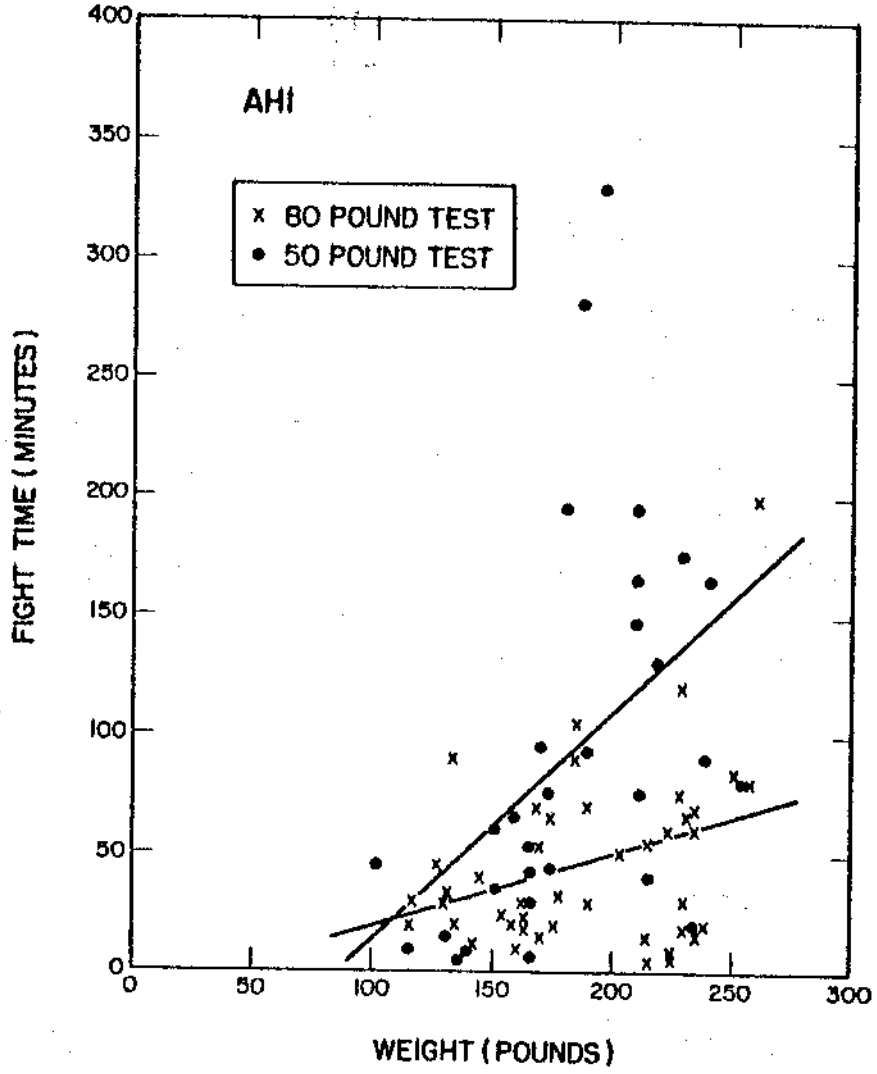

Figure 7.--Relationship of fighting time to weight of ahi on 50- and 80-lb test lines.

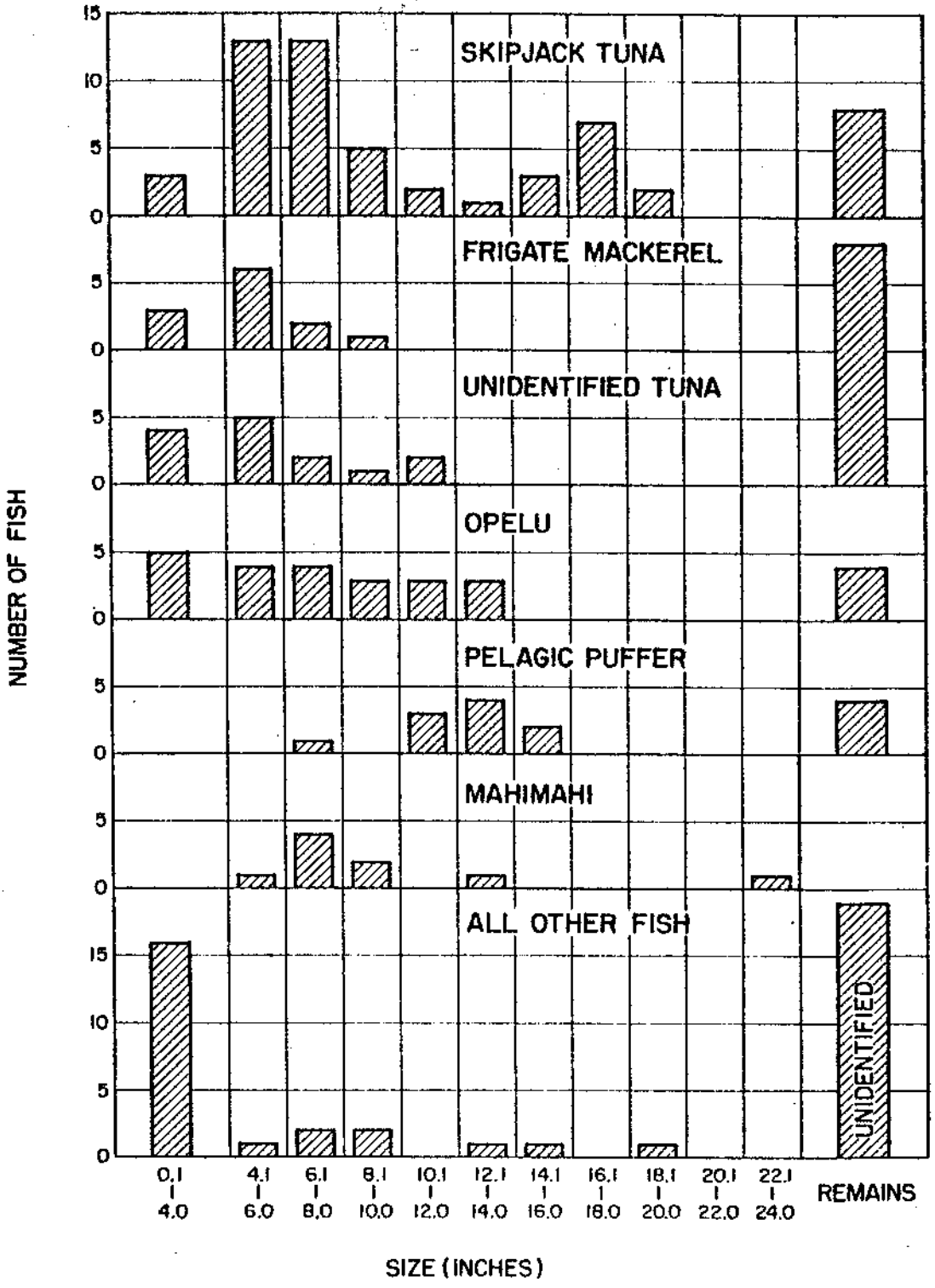

Figure 8.--Numbers and lengths of fish found in blue marlin stomachs.

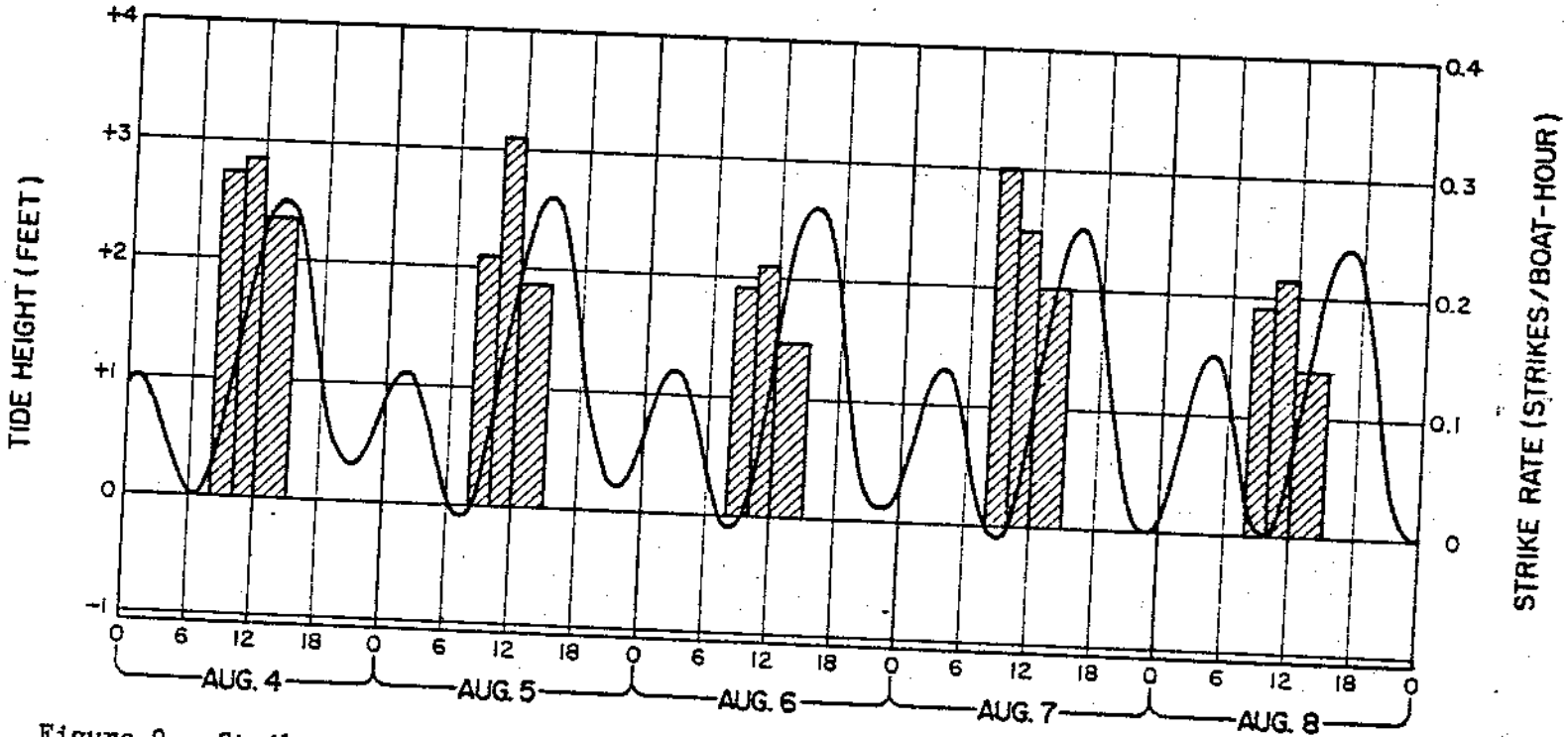

Figure 9.--Strike rates and tide cycle for Hawaiian International Billfish Tournament 1975.

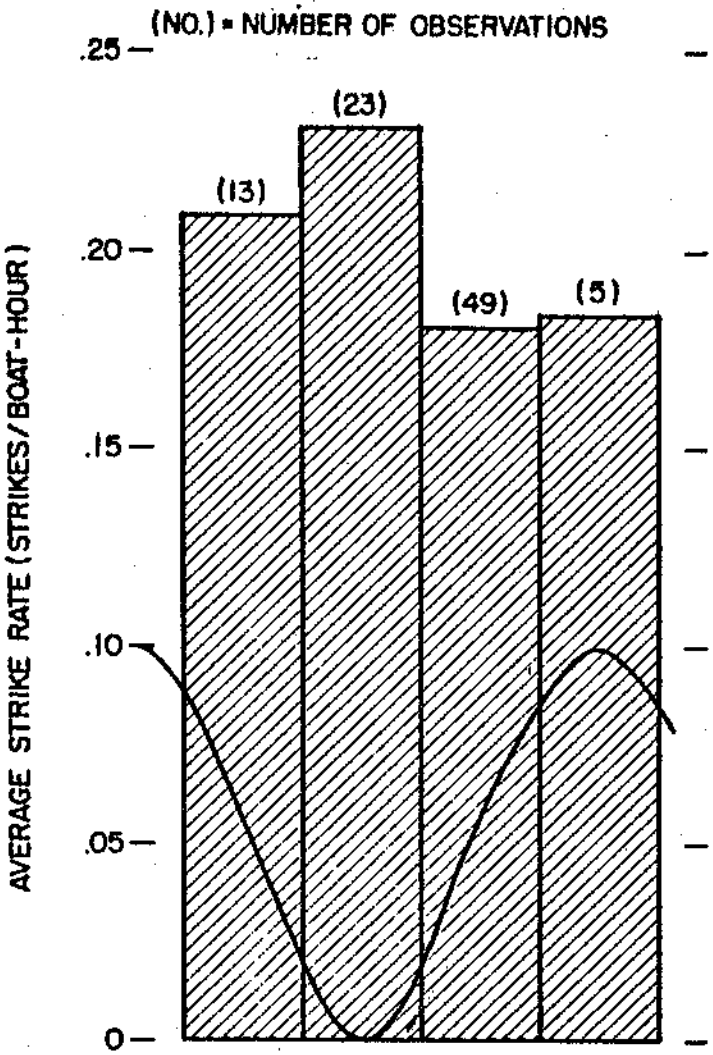

Figure 10.--Average strike rates (HIBT 1970-75) at various tide phases.

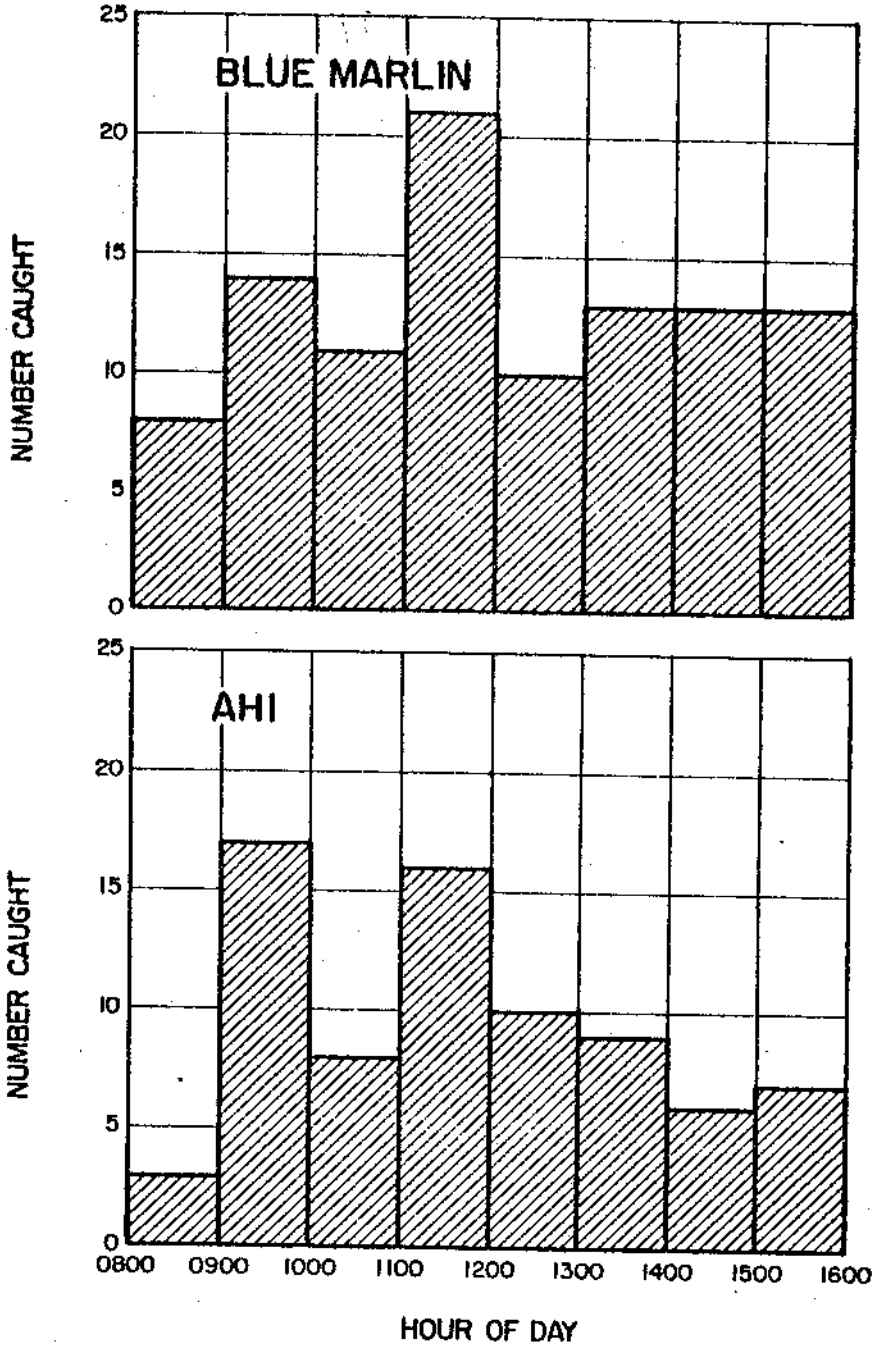

Figure 11.--Fish catch and time of day for blue marlin and ahi.